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~~Description~~

~~Determination of the operability of a radio channel~~

The present invention relates to a method for determining the operability of at least one radio channel in a mobile radio communication system, ~~especially in a mobile radio system~~. The invention also relates to a transmitting and/or receiving station for a mobile radio communication system, especially a base station or a mobile station for a mobile radio system, for transmitting and/or receiving communication information which is transmitted ~~via~~ an air interface.

Description of the Prior Art

It is known to use physical channels for transmitting communication information in radio communication systems. The communication information, especially speech data or computer data, is ~~are~~ transmitted from a transmitting station to a receiving station via an air interface by using these physical channels. Parameters of the physical channels are, for example, a certain timeslot in a TDMA (Time Division Multiple Access) radio communication system, a certain carrier frequency which is used during the transmission of the communication information in an FDMA (Frequency Division Multiple Access) radio communication system and a certain code via ~~by means of~~ which the communication information is coded for radio transmission in a CDMA (Code Division Multiple Access) radio communication system. Combinations of the known multiple access methods TDMA, FDMA and CDMA are possible. In a combined TDMA, FDMA radio communication system, for example, a physical radio channel is, ~~therefore~~, defined by its timeslot and either its radio frequency or carrier frequency, respectively.

In known mobile radio systems, particularly ~~especially~~ in the global system for mobile telecommunication (GSM), the radio channels via which communication information

can be transmitted between a certain base station and a certain mobile station, are issued centrally via a coordination unit. The coordination unit selects the individual control units of the base stations operated in the GSM and assigns the radio channels to them.

However, radio communication systems are also known which operate in so-called uncoordinated mode. In such systems, the radio channels are not issued centrally for the entire system, but, instead, the stations involved in a radio link select their own radio channels from an existing pool of available radio channels. An example of a station operating in uncoordinated mode is the mobile station of a mobile radio system according to the DECT standard.

If the mobile station notices, for example, that the bit error rate on a receive channel has exceeded a permissible limit value, it selects a radio channel from a list of available radio channels and initiates a change from the previously used radio channel to the selected radio channel. The change is performed with the aid of known, established protocols according to which signaling information is exchanged between the mobile station and the associated base station.

It is also known that such a list, which contains data on the operability of available radio channels, is generated in accordance with the following method: at least one observed radio channel which is currently not used for transmitting or receiving the communication information, in the transmission of which the transmitting and/or receiving station is involved, is observed via a receiving device of a transmitting and/or receiving station. To observe the observed radio channel, the received field strength is measured via a receiver which is tuned to the observed radio channel. The received field strength generally has a

value of greater than zero. Reasons for this are, for example, interference due to radio channels at the same or approximately the same frequency which are used on other transmission links of the same radio communication system or another radio communication system, other interference signals which arrive at the receiving device at the set frequency, or a level of background noise which is inherent in the receiving device and/or a downstream device. For this reason, a maximum value for the field strength is established which is allowed to be reached at a maximum during the measurement of the observed radio channel. If the field strength exceeds this maximum value, the observed radio channel is marked as occupied or inoperable in the list of operable radio channels. To update the list, the measurement of the field strength is repeated and, in each case, another check is made as to whether the maximum value is exceeded. Correspondingly, the entry in the list is updated with each measurement, in such a manner that it is always the result of the last most current measurement which is entered in the list.

It is known also to make the selection of a radio channel in the same manner described above if there if no radio link as yet but is only to be set up. It is also known to observe not only one observed radio channel but also ~~to observe~~ all available radio channels which are currently not used themselves by the measuring station. Thus, for example, a total of 120 physical channels distributed over, in each case, 12 timeslots of 10 carrier frequencies are available for the downlink from a base station to a mobile station in a radio communication system according to the DECT standard. In this TDMA/FDMA-based system, a mobile station, therefore, must observe up to 120 physical channels.

It is known, especially from communication based on fixed lines, in which communication information is transmitted via fixed

transmission lines such as optical fiber cables or copper cables, to subdivide the communication information into individual information packets in each case and to transmit the information packets in succession at time intervals via the fixed lines. For future radio communication systems such as, for example, the universal mobile telecommunication system (UMTS), it is being considered also to allow the transmission of information packets. As such ~~In consequence~~, it is possible that communication information will only be transmitted from time to time on some or all radio channels used. Furthermore, there will be only a low electrical field strength, at least from time to time, even on radio channels which are being used in this case. In the known method for determining the operability of a radio channel in which a conclusion about the operability is in each case drawn from the last measurement of the field strength of an observed radio channel, wrong conclusions can, therefore, be obtained. If the last measurement of the field strength of an observed radio channel takes place precisely in the transmission interval between two transmitted information packets, it is erroneously found that the observed radio channel is available and can, thus, be used for a new radio link to be set up or an existing one.

In existing both and ~~also in~~ future radio communication systems, oscillator crystals are used in the transmitting and/or receiving stations. From ~~from~~ the ~~in each case~~ constant frequency of oscillation of those ~~which~~ crystals, the time base for a TDMA multiple access system is derived. In practice, however, the frequencies of oscillation of the individual oscillator crystals used in the system are not exactly of the same magnitude. For this reason, it frequently happens that used radio channels appear to be drifting in time from the point of view of a transmitting and/or receiving station which is observing observed radio channels

which have a common carrier frequency. Drifting in time is understood to be the fact that a radio channel which is allocated to a certain timeslot of a radio link external to the station

matches a first radio channel at a first earlier time and matches a second radio channel at a second, later time. The first and the second radio channel are radio channels which are different from one another and are available to the observing station and which are allocated to different timeslots of the same carrier frequency. From the point of view of the observing station, therefore, the radio channel external to the station drifts over its own timeslots in time.

It is the object of the present invention to specify a method for determining the operability of at least one observed radio channel in a radio communication system, especially in a mobile radio system, by means of which the operability of the observed radio channel can be determined as reliably as possible. Furthermore, it is the object of the present invention to specify a transmitting and/or receiving station for a radio communication system, especially a base station or a mobile station for a mobile radio system which can determine the operability of an observed radio channel with the greatest possible reliability.

The object is achieved by a method having the features of claim 1 and, respectively, by a transmitting and/or receiving station having the features of claim 10. Further developments are the subject matter of the dependent claims.

In the method according to the invention, the at least one radio channel, the operability of which is to be determined, is an observed radio channel, the operating state of which is established continuously in time and/or repeatedly. The operability of the observed radio channel is determined by evaluating the history of the operating state. It is thus possible, especially also in the case of radio channels drifting in time, to reliably determine the operability of the at least one observed radio channel. Furthermore, the utilization of a radio channel for the transmission of information

and the second radio channel are radio channels which are different from one another, ~~and~~ are available to the observing station and ~~which~~ are allocated to different timeslots of the same carrier frequency. From the point of view of the observing station, therefore, the radio channel external to the station drifts over its own timeslots in time.

From WO 97/47147, a radio telecommunication system is known in which a set of channels is provided both for radio telecommunication according to a cellular telecommunication system and radio telecommunication according to a cordless telecommunication system, in which a mobile part of the multimode radio communication system, in as much as it is not located in the radio coverage area of a base station of the cordless telecommunication system, is allocated to a base station of the cellular telecommunication system. If the mobile part moves into the radio coverage area of a cordless base station, the mobile part initiates a registration procedure for registering in this base station in which, among other things, a list with the channels not used by the cellular telecommunication system and thus available for cordless telecommunication is transmitted to the cordless base station. This ~~this~~ channel list is ~~being~~ determined by Via ~~means of~~ field strength measurements of the individual channels of the multimode radio telecommunication system in a state of the mobile part in which it does not maintain a radio link.

From US 5,453,666, a method in a system, in which frequencies (channels) from a frequency band both of a cellular telecommunication system and of a cordless telecommunication system are used is known in which a scanner of a cellular telecommunication system examines the channels for determining the frequencies available for the cellular telecommunication system, by measuring the field strength

of the channels sequentially and repeatedly until it is stopped, for example, by a timer.

It is an ~~the~~ object of the present invention, therefore, to determine the operability of at least one radio channel in a radio communication system, especially in a mobile radio system for discontinuous information packets to be transmitted in the system or in radio channels which are drifting in time in the system.

SUMMARY OF THE INVENTION

~~The object is achieved by a method having the features of claim 1 and, respectively, by a transmitting and/or receiving station having the features of claim 10. Further developments are the subject matter of the dependent claims.~~

Accordingly, in ~~In~~ the method according to the present invention, the at least one radio channel, the operability of which is to be determined, is an observed radio channel, the operating state of which is established continuously in time and/or repeatedly. The operability of the observed radio channel is determined by evaluating the history of the operating state. It is thus possible, especially ~~also~~ in the case of radio channels drifting in time, to reliably determine the operability of the at least one observed radio channel. Furthermore, the utilization of a radio channel for the transmission of information

packets ~~can~~ also can be reliably established. In various ~~the~~ embodiments of the method of ~~according to~~ the present invention, the history is evaluated in different manners, in which individual types of evaluation ~~can~~ also can be combined with one another. In each case, information on the past of the operating state is available in the determination of the operability of the observed radio channel so that, for example, the change of an existing radio link to another radio channel not otherwise used is possible with great reliability.

In an embodiment of the method according to the present invention, a mean value of the operating state is determined over a period of observation in the evaluation of the history. If the period of observation is, for example, one minute, counted in each case from the time of the most current recent determination of the operating state, and if the operating state is established continuously in time and/or repeatedly in the period of observation, radio channels used for the transmission of information packets can be reliably determined. In a further development, mean values of the operating state are determined over a plurality of periods of observation following one another. In this manner, frequency of a disturbance of a radio channel which occurs ~~recurs~~ at irregular intervals can be additionally determined, for example. If a disturbance occurs, for example, only once in a long overall period of observation, the corresponding observed radio channel can still be marked as operable since a further disturbance is not probable and/or since any further disturbance will not be important. The communication information transmitted during such a further disturbance can be retransmitted by the transmitting station, for example on request by the receiving station, so that the transmission is complete overall.

As an alternative or in addition to forming a number ~~plurality~~ of mean values over successive periods of observation,

a multiplicity of individual values of the operating state relating to successive times of observation is determined in another embodiment. The evaluation ~~can~~ is then be made in a similar manner as in the case of the mean values.

In a preferred embodiment, the value of a measured value characteristic of the operating state of the respective observed radio channel is determined in the establishment of the operating state. Thus, measured values exist which can be compared, for example, with a limit value. In a further development, it is established during the evaluation of the history whether the measured value has reached, ~~or~~ exceeded or undershot a predetermined limit value in a period of observation. If this is so, the observed radio channel, for example, is marked as inoperable. As an alternative, the observed radio channel can only be marked as inoperable after the limit value has been reached or exceeded or undershot several times. Furthermore, in ~~a further development~~ another embodiment, it is established either as an alternative or additionally whether a mean value of the characteristic measured value over a period of observation, or a number of mean values over in each case one period of observation, have reached, ~~or~~ exceeded or undershot the predetermined limit value or a second predetermined limit value. If the operability of a radio channel is to be determined with especially high reliability in this further development, no individual measurement value must have reached or exceeded or undershot the limit value in a first, shorter period of observation and the mean value ~~or none~~ or the mean values must have reached, ~~or~~ exceeded or undershot the second predetermined limit value in a second, longer period of observation. Meaningful values for the length of the predetermined periods of observation are, for example, 3 seconds for the first, shorter period and 10 seconds or 1 minute for the second, longer period of observation.

Here, too, it is advantageous if a single short-time fluctuation of the measured value remains unconsidered in the evaluation of the history. Reasons for this have already been mentioned above.

In a further embodiment of the method according to the present invention, in which the operating state of a ~~plurality~~ number of the observed radio channels is in each case determined, a correlation of the development of the operating state with time of at least a part of the observed radio channels is determined in the evaluation of the history. If a high correlation, for example of two or more radio channels, is found, which are physical channels of a TDMA (Time Division Multiple Access) radio communication system, a temporal drift of a radio channel can be determined from the correlation of the development of the observed radio channels with time which have the same radio frequency. Apart from the correlation of the development with time, the time interval between occurrences of interference signals on observed radio channels of the same frequency are observed and evaluated as an alternative or in addition. This procedure is based on the concept that the drift of a radio channel with time occurs at an approximately constant drift rate.

If such a constant drift rate with time is found, the presence of a radio channel drifting with time is concluded. Accordingly, either all radio channels affected by the drift are marked as inoperable or a precalculation is performed which radio channels will be inoperable in which period. In both cases, it is possible but not necessary that all radio channels of the same frequency are observed, i.e., are observed radio channels. Instead, it is sufficient to observe a ~~plurality~~ number of the radio channels of the same frequency, for example, three or four radio channels. The observed radio channels are preferably allocated successive timeslots of the common radio frequency.

The information which is found continuously in time and/or repeated during the observation of the at least one observed radio channel is preferably stored. In particular, a measure of the operating state is repeatedly established and in each case a corresponding value is stored in a data field of a data memory for storing the development of the operating state with time. The values stored in the data field can then be accessed, for example by an evaluating device provided in an observing transmitting and/or receiving station and the operability of the observed radio channel for transmitting and/or receiving communication information can be determined. The station preferably exhibits a receiving device via which the at least one observed radio channel can be observed which is currently not used for transmitting and/or receiving the communication information. The receiving device can be the same receiving device via which the communication information is received or there is, for example, a second receiving device so that it is possible to simultaneously observe and receive. In the first-mentioned case, for example, the receiving of the communication information at predetermined times or at times agreed with the transmitting station is interrupted so that an observation of the at least one observed radio channel takes place in the phases of interruption.

In a further development, there are registers into which the most current value established is entered in each case for an observed radio channel and, furthermore, there is a read-out unit which reads the current values from the registers. After that, the values read out are immediately evaluated, for example the exceeding of a limit value is checked and/or the values read out are written into a storage device for storing values which reproduce the history of the operational

state of the at least one observed radio channel.

Sub A3 ~~Exemplary embodiments of the invention will now be explained in greater detail with reference to the attached drawing. However, the invention is not restricted to these exemplary embodiments. In the individual figures of the drawing:~~

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Figure 1 shows a table with operable and inoperable radio channels of an FDMA/TDMA-based system;

Figure 2 shows a diagram with six measured values which reproduce the operating state of an observed radio channel; and

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Figure 3 shows a base station and a mobile station in a mobile radio system.

Ins A4 Figure 1 shows a table of an FDMA/TDMA-based radio communication system which provides an overview of the operability of a total of 60 physical radio channels. The physical radio channels in each case correspond to a combination of a timeslot TS and a carrier frequency f. On each of the carrier frequencies f1...f6, communication information can be transmitted in 10 timeslots TS0...TS9.

In a variant, not shown, the radio communication system also exhibits a CDMA (Code Division Multiple Access) component. In this case, a three-dimensional table must be managed in order to have an overview of the operability of the radio channels.

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The FDMA/TDMA system corresponding to the table shown in ~~figure~~ Figure 1 is a system in which duplex links are set up and operated in each case between a base station and a mobile station of a mobile radio network. The respective downlink via which communication information is transmitted from the base station to the

mobile station, and the respective uplink via which communication information is transmitted from the mobile station to the base station, use different timeslots of the same carrier frequency. In this arrangement, there is a fixed association between the downlink radio channel and the associated uplink radio channel. In accordance with the fixed association, the timeslot of the downlink radio channel is always one of timeslots TS0...TS4 and the timeslot of the uplink radio channel is always one of timeslots TS5...TS9. Furthermore, the first timeslot TS0 of the first timeslot group TS0...TS4 is, in each case, associated with the first timeslot TS5 of the second timeslot group TS5...TS9, the second timeslot TS1 of the first timeslot group is associated with the second timeslot TS6 of the second timeslot group, and so on. The mutually associated radio channels use the same carrier frequency f here, as already mentioned. In the case of duplex links, it is thus sufficient to observe only the radio channels available for downlinks or only the radio channels available for uplinks.

First exemplary embodiment

In a first exemplary embodiment, only these duplex links are operated in an observed radio communication system. A mobile station will now be considered which receives communication information from a base station on radio channel TS1/f6. Accordingly, the mobile station transmits communication information to the base station on radio channel TS6/f6.

To determine information for a change of channel in the case of a disturbance of at least one of the radio channels currently used by the mobile station, the mobile station repeatedly observes the operating state of all available downlink radio channels at regular intervals, with the exception of the radio channel TS1/f6 currently used by it.

For this purpose, the mobile station exhibits a multiplicity of receivers which are, in each case, set to a timeslot/frequency combination. Thus, they are at least (6×5)-1 receivers each. Each receiver is associated with a register in which the most current measured value in each case of the field strength of the respective radio channel measured by a test set is entered. The measured values stored in the registers are successively repeatedly read out in multiplex mode and written into a data memory. In the data memory, the measured values of the field strength from each of the observed radio channels over a period of observation with a length of 3 seconds are stored. ~~the~~ The period of observation in each case extends ~~extending~~ into the past beginning from the time of the most current measurement.

With readout cycles which are constant in time and in which each register is read out once in each case, the predetermined length of the period of observation corresponds to a fixed number of storage spaces in a data field which is, in each case, allocated to one observed radio channel. In this arrangement, the value of a pointer variable marks for each data field the oldest measured value which is still stored. If a new measured value is entered again into the data field, the oldest measured value is overwritten and the pointer variable is sent to the next storage space following in the data field.

If ~~then~~ the mobile station then notices a disturbance in the radio channel currently used for the transmission of communication information, for example due to an intolerably high bit error rate, ~~and~~ a valuation program is started. By ~~which, by~~ evaluating the measured values stored in the individual data fields, the Valuation program establishes whether an observed radio channel is unoccupied, or ~~i.e.~~ not otherwise used in the mobile radio system, or is disturbed in another manner.

In a variant of the first exemplary embodiment, the associated base station conducts corresponding measurements and,

in the case of a disturbance, a fast exchange of information takes place between base station and mobile station in order to determine a pair of operable mutually associated radio channels for a duplex link. In a second variant, the mobile station concludes from the operability of a downlink radio channel that the associated uplink radio channel is also operable.

Neither of the two variants require that the history of all observed radio channels be evaluated. Instead, it is sufficient to continue the evaluation until an idle radio channel has been found.

In the table of Figure ~~figure~~ 1, the radio channels otherwise used or disturbed at the time of the disturbance are marked by gray shading of the respective fields. However, the mobile station does not carry a complete list of the radio channels currently used or disturbed but only that ~~beings~~ to evaluate the measured values stored in the data fields of the data memory in the case of a disturbance. It begins with radio channel TS0/f1 in which it establishes that the radio channel is otherwise used. The mobile station thus continues the evaluation with radio channel TS1/f1 and establishes that this radio channel is operable. It initiates the change of radio channels from TS1/f6 to TS1/f1 (downlink) and from TS6/f6 to TS6/f1 (uplink). Correspondingly, the radio link can be continued essentially without noticeable interruption.

<u>Second exemplary embodiment</u>

The method according to the second exemplary embodiment is preferred for operational situations in which the evaluation of the history would take too long if it is only begun in the case of a disturbance. In distinction from the first exemplary embodiment, the evaluation program evaluates the total available development of the observed radio channel with time in each case after the updating of a data field

by writing in a new measured value and enters a corresponding mark into a table which corresponds to the table shown in Table ~~Figure~~ 1. There are two possibilities for marking in this case. Either the evaluation comes to the conclusion that the respective radio channel is currently undisturbed or not otherwise used, or it comes to the conclusion that the radio channel is disturbed or otherwise used. If the evaluation leads to the same result as the evaluation last performed for the same radio channel, the marked value in the table does not need to be changed.

The mobile station receives the marked values for the uplink radio channels either from the base station or it concludes from the disturbance of a downlink radio channel that the associated uplink radio channel is also disturbed. The complete table of uplink and downlink radio channels needs to be managed only either by the mobile station or by the base station.

In a variant, the complete table, therefore, is only managed in the base station and the mobile station only manages a table which covers timeslots TS0...TS4. Furthermore, no mark needs to be entered in the table for the uplink radio channel belonging to the currently used downlink radio channel. The information about which uplink radio channel is currently used is available, in any case.

On the other hand, it is of advantage in many operational situations to manage the complete list of the disturbed or inoperable uplink and downlink radio channels since conclusions can be drawn from the undisturbed state of an associated uplink radio channel in the evaluation of the history of a possibly disturbed downlink radio channel. This is because, for example, if only a single measured value of the field strength of the downlink radio channel is above the predetermined limit value and if the associated uplink radio channel is not

disturbed, this single measured value will not be taken into consideration and the downlink radio channel will be marked as idle.

In another variant, trust is put in the fixed association of the duplex radio channels and only the list of downlink radio channels or the list of uplink channels is managed.

An example of the evaluation of the history of the operating state will now be given with reference to figure 2.

Third exemplary embodiment

Figure 2 shows a total of six measured values for the field strength E which is measured in an observed radio channel. The field strength is measured at regular intervals or, respectively, a register which contains the current measured values of the field strength is read out at regular intervals.

In the representation of Figure ~~figure~~ 2, both the field strength E and the time t are plotted in arbitrary units. The unit of time corresponds to the time interval between the measured values.

In the evaluation of the history which is reproduced by the measured values, a check is made as to whether the measured values exceed the permissible maximum value E_G of the field strength. In the case shown in Figure ~~figure~~ 2, only the fifth measured value exceeds the maximum value E_G. Furthermore, the mean value of all measured values taken in the period of observation shown is represented in Figure ~~figure~~ 2. The mean value is represented by a continuous horizontal line, for example at E=2.25. The mean value is distinctly below the maximum value E_G. Apart from comparing it with the maximum value E_G, the mean value ~~can~~ also can be assessed by calculating the variance of the measured values in the period of observation and by comparing it with a second lower maximum value for the mean field strengths.

The observed radio channel is marked, for example, as operable or inoperable in dependence on this assessment.

In the third exemplary embodiment, the following criteria for the operability of the observed radio channel apply:

- None of the measured values in the period of observation can exceed the maximum value E_G.
- Mean values are, in each case, formed for equally long successive periods of observation of lengths t=6. None of these mean values can exceed a second predetermined maximum value for the mean field strengths in the period of observation.

In the case shown in Figure ~~figure~~ 2, the first criterion is not met so that the associated observed radio channel is marked as inoperable. However, the mean value is below the second limit value for the mean field strength in the period of observation shown. If, therefore, no measurement value above the maximum value E_G is established in following periods of observation and if a mean value below the second limit value for the mean field strength is also found in the following periods of observation, both criteria are met so that the mark can be changed to "operable". For the rest, the procedure is exactly the same as in the first exemplary embodiment or the second exemplary embodiment.

The criteria in the third exemplary embodiment were selected as described above in order also to be able to establish the transmission of information packets on the observed radio channel. The first criterion mentioned takes account of the irregular transmission of information packets in time. The fact that a single measured value which exceeds the maximum value E_G ~~can~~ also can be a freak value or measuring error, is taken into account by the second criteria. Thus, a practicable compromise has been found between the demand of reliably establishing the operability of

an observed radio channel, on the one hand, and a demand always to have a spare operable radio channel, if at all possible, on the other hand.

Figure 1 shows a base station 2 of a mobile radio system which is connected to a control processor for controlling the base station 2. Furthermore, the base station 2 is connected to an antenna device 1 for transmitting and receiving communication information via an air interface 5 to a multiplicity of mobile stations.

Representative of the multiplicity of mobile stations, one mobile station 10 is shown in Figure 3. The mobile station 10 exhibits a receiving device 13 having ~~comprising~~ an antenna device, 11 and a register 12. The receiving device 13 observes, via the antenna device 11, at least one observed radio channel which is currently not used for transmitting or receiving communication information. For this purpose, the receiving device 13 measures the field strength of the observed radio channel and stores the most current measured value in each case in register 12.

Furthermore, the mobile station 10 exhibits a readout and storage device 14 for reading out and storing at regular time intervals the measured values stored in the register 12. A number ~~plurality~~ of measured values read out which correspond to successive measurement times are ~~is~~ stored in the readout and storage device.

Furthermore, an evaluating device 15 which, if necessary, that is to say in the case of a disturbed radio channel which is currently used for transmitting or receiving communication information to or~~,~~ ~~respectively,~~ from the mobile station 10, before a radio link of the mobile station 10 is set up and/or continuously during an existing radio link, evaluates the history of the measured values for the field strength of the observed radio channel in order to determine the operability of the observed radio channel,

is provided in the mobile station 10. The mobile station 10 can be operated, in particular, in accordance with one of the exemplary embodiments described above.

The exemplary embodiments of the invention described are particularly suitable for the so-called uncoordinated operation in a future mobile radio system, for example the universal mobile telecommunication system (UMTS) in the TDD (Time Division Duplex) mode of operation. However, the invention ~~can~~ also can be advantageously used in other systems, for example in systems which are operated in accordance with the DECT standard, the transmission of packet information also being permitted in distinction from the currently used mode of operation.

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Patent Claims

1. A method for determining the operability of at least one radio channel in a radio communication system, especially in a mobile radio system, the at least one radio channel being an observed radio channel, characterized in that the operating state of which is established continuously in time and/or repeatedly over a number of successive frames and in which the operability of the observed radio channel is determined by evaluating the resultant history of the operating state.

2. The method as claimed in claim 1, in which a mean value of the operating state is determined over a period of observation in the evaluation of the history.

3. The method as claimed in claim 1 or 2, in which the value of a measured value (E) characteristic of the operating state of the respective observed radio channel is determined in the establishment of the operating state.

4. The method as claimed in claim 3, in which it is established during the evaluation of the history whether the measured value (E) has reached or exceeded or undershot a predetermined limit value in a period of observation.

5. The method as claimed in claim 3 or 4, in which a short-time fluctuation of the measured value (E) remains unconsidered in the evaluation of the history.

6. The method as claimed in one of claims 1 to 5, in which the operating state of a plurality of the observed radio channels is in each case established and in which a correlation of the development

of the operating state of at least some of the observed radio channels with time is determined in the evaluation of the history.

7. The method as claimed in claim 6, in which the radio channels are physical channels of a TDMA (Time Division Multiple Access) radio communication system and in which a temporal drift of a radio channel is established from the correlation of the development of observed radio channels of the same radio frequency with time.

8. The method as claimed in one of claims 1 to 7, in which a measure of the operating state is repeatedly established and in each case a corresponding value is stored in a data field of a data memory for storing the development of the operating state with time.

9. The method as claimed in one of claims 1 to 8, in which the radio channels are physical channels of a TDMA (Time Division Multiple Access)/FDMA (Frequency Division Multiple Access) radio communication system and in which the operating state of each available radio channel is known or is established by observing the at least one observed radio channel.

10. Transmitting and/or receiving station (10) for a radio communication system, especially a base station or mobile station for a mobile radio system, for transmitting and/or receiving communication information which is transmitted via an air interface (5), comprising

- a receiving device (13) via which at least one observed radio channel, which is currently not used for transmitting or receiving the communication information, can be observed by establishing its operating state continuously in time and/or repeatedly over a number of successive frames,

- a storage device (14) for storing values which reproduce the history of the operating state of the at least one observed

radio channel resulting from this establishing, and

- an evaluation device (15) for determining the operability of the observed radio channel for transmitting and/or receiving the communication information by evaluating the history of the operating state.